DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
Document Control Center – WO66-G609
Silver Spring, MD 20993-0002

Oriental Resources Development Limited
% Mr. Michael Lee
AcmeBiotechs Company, Limited
No. 45 Minsheng Road, Danshui Town
New Taipei City, Taiwan 251
Republic of China

February 17, 2015

Re: K140913
Trade/Device Name: NuROs Bone Graft Substitute
Regulation Number: 21 CFR 888.3045
Regulation Name: Resorbable calcium salt bone void filler device
Regulatory Class: Class II
Product Code: MQV
Dated: December 31, 2014
Received: January 8, 2015

Dear Mr. Lee:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing

(21 CFR Part 807); labeling (21 CFR Part 801); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Mark N. Melkerson -S

Mark N. Melkerson
Director
Division of Orthopedic Devices
Office of Device Evaluation
Center for Devices and
Radiological Health

Enclosure

Indications for Use

510(k) Number (if known): K140913

Device Name: NuROs Bone Graft Substitute

Indications for Use:

NuROs Bone Graft Substitute is an implant intended to fill bony voids or gaps of the skeletal system, i.e., extremities and pelvis. These osseous defects are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. NuROs Bone Graft Substitute resorbs and is replaced with bone during the healing process.

Prescription Use ___X___ AND/OR Over-The-Counter Use_____
(Part 21 CFR 801 Subpart D) (21 CFR 801 Subpart C)

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

CONCURRENCE of CDRH, Office of Device Evaluation (ODE)

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Section 5

510(k) Summary

510(k) Summary

5.1 **Type of Submission:** Traditional

5.2 **Preparation Date:** 25th March 2014

5.3 **Submitter:**

Address:	2F., No.30, Hexing Rd., Hukou Township, Hsinchu County 303, Taiwan (R.O.C.)
Phone:	+886-3-5997135 Ext. 843
Fax:	+886-3-6208066
Contact:	Wei-Chun Chang (raychang@feg.com.tw)
Registration number:	3010275504

5.4 **Identification of the Device:**

Proprietary/ Trade name:	NuROs Bone Graft Substitute
Classification Name:	Resorbable calcium salt bone void filler device
Device Classification:	II
Regulation Number:	888.3045
Panel:	Orthopedic
Product Code:	MQV

5.5 **Identification of the Predicate Device:**

Predicate Device Name:	BlOSORB® Resorbable Bone Void Filler
Manufacturer:	Sciences et Bio Matériaux
Product Code:	MQV
510(k) Number:	K021963

5.5 Intended Use and Indications for Use of the subject device.

NuROs Bone Graft Substitute is an implant intended to fill bony voids or gaps of the skeletal system, i.e., extremities and pelvis. These osseous defects are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. NuROs Bone Graft Substitute resorbs and is replaced with bone during the healing process.

5.6 Device Description

NuROs Bone Graft Substitute is an osteoconductive bone void filler with interconnective pore system. It is made of synthetic beta-tricalcium phosphate (β-TCP) indicated for bone void filling. It is suitable for individuals with bone voids of gaps, caused by surgery or trauma.

NuROs Bone Graft Substitute is available in granule type and block type with different volumes which are 1c.c, 2.5c.c, 5c.c, 10c.c, 20c.c, 25c.c and 30c.c. Granule types are provided in 0.2 ~ 0.5mm, 0.5 ~ 1mm, 1 ~ 2mm and 3mm of particle size. Block type is provided in 5mm x 5mm x 10mm, 5mm x 5mm x 20mm, 10mm x 10mm x 10mm and 10mm x 25mm x 25mm size.

NuROs Bone Graft Substitute is pure β-TCP with all crystalline phase. The Ca/P ratio is 1.5. The structure of the material is multidirectional interconnective porosity with >70% porosity. The propose device does not impart mechanical strength to surgical site.

The NuROs Bone Graft Substitute is gamma irradiated and provided for single use only.

5.7 Non-clinical Testing

5.7.1 Biocompatibility

According to ISO 10993 <<Biologic evaluation of medical devices>> and to the type of medical device (long-term implantable medical device, bone/tissue contact) the following biologic effects have been investigated:

- Cytotoxicity
- Sensitization
- Intracutaneous Irritation reactivity
- System Toxicity (Acute)
- Subchronic Toxicity (Subacute Toxicity)
- Genotoxicity
- Implantation
- Pyrogenicity

Testing performed on NuROs shows biocompatible with no significant adverse observations of any kind.

5.7.2 Bench test

A series of bench tests were conducted on the proposed device, NuROs Bone Graft Substitute.

- Chemical Composition
- Elemental Analysis
- Structure Observation
- Specification of Device Porosity
- TGA-residue Analysis
- Ultra Trace Elements
- pH Test
- Pore Size Distribution

The results showed that the proposed device have the same characteristics as the predicate device.

5.7.3 Animal Test

The animal test was conducted to observe the difference in degradation rate, bone-defect interface and the state of overall healing in the animal between

proposed device and predicate device. The bone grafts were implanted into porcine models and tracked for a period of time. Each tibia of the pig was drilled with two blind-ended tunnels and different bone grafts were implanted into each tunnel of each leg. CT Scans, X-rays and Histomorphometry were taken in order to observe and assess the results. The diameters of the defects were measured and recorded at each point in time to illustrate the degradation rate of the implant and healing rate of the bone defect. After the 1st and the 3rd month, the data showed that the proposed device, NuROs Bone Graft Substitute is as effective as the predicate device.

A series of safety tests were performed to assess the safety and effectiveness of the NuROs Bone Graft Substitute.

Testing Item	**Standard and regulations applied**
Biocompatibility	ISO 10993-1 Biological evaluation of medical devices -- Part I : Evaluation and testing.
	ISO 10993-3 Biological evaluation of medical devices -- Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity
	ISO 10993-5 Biological evaluation of medical devices -- Part 5: Tests for in vitro cytotoxicity
	ISO 10993-6 Biological evaluation of medical devices -- Part 6: Tests for local effects after implantation
	ISO 10993-10 Biological evaluation of medical devices -- Part 10: Tests for irritation and skin sensitization
	ISO 10993-11 Biological evaluation of medical devices -- Part 11: Tests for systemic toxicity
	ISO 10993-12 Biological evaluation of medical devices --- Part 12: Sample preparation and reference material
Sterilization and shelf life	ISO 11737-1:2006 Sterilization of medical devices - Microbiological methods - Part 1: Determination of a population of microorganisms on products
	ISO 11737-2:2009 Sterilization of medical devices – Microbiological methods – Part 2: Tests of sterility performed in the definition, validation and maintenance of a sterilization

	process
	ISO 11137-2:2009 Sterilization of health care products – Radiation – Part 2: Establishing the sterilization dose
	ASTM F1980-07 Standard Guide for Accelerated Aging of Sterile Barrier Systems for Medical Devices
	ASTM F88-85 Standard Test Method for Seal Strength of Flexible Barrier Materials
	ASTM F1140:2000 Standard Test Methods for Internal Pressurization Failure Resistance of Unrestrained Packages for Medical Applications.
	ASTM D4332: 2001 Standard practice conditioning containers, packages or packaging components for testing
	ASTM 1608 Standard Test Method for Microbial Ranking of Porous Packaging Materials (Exposure Chamber Method)
	ASTM F1929-98 Standard test Method for Detecting Seal Leaks in Porous Medical Packaging by Dye Penetration
Performance	ASTM F1088-04a Standard Specification for Beta-Tricalcium Phosphate for Sugical Implantation

NuROs Bone Graft Substitute conforms to the recognized consensus standard specification for surgically implantable beta-tricalcium phosphate. The biocompatibility of beta-TCP implants is also well documented. As a biomaterial, beta-TCP has consistently proven to be non-toxic, non-allergenic, and biocompatible and elicits no inflammation. No adverse system effects have been observed.

All the test results demonstrate NuROs Bone Graft Substitute meets the requirements of its pre-defined acceptance criteria and intended uses.

5.8 Clinical Testing

No clinical test data was used to support the decision of safety and effectiveness.

5.9 EMC and Electrical safety

The devices do not require EMC/Electrical Safety evaluation.

5.10 Substantial Equivalence Determination

The NuROs Bone Graft Substitute has similar intended use, fundamental scientific technology, and technological characteristics with the predicate device. Information described below can demonstrate the NuROs Bone Graft Substitute is substantial equivalent to the predicate device.

Item	Predicate Device	Subject Device
Trade name	BIOSORB® Resorbable Void Filler	NuROs Bone Graft Substitute
K number	K021963	
Regulation no./ Class	888.3045 / II	888.3045 / II
Classification name	Resorbable calcium salt bone void filler device	Resorbable calcium salt bone void filler device
Product code/ Device panel	MQV / Orthopedic	MQV / Orthopedic
Intended use	BIOSORB® Resorbable Void Filler is a resorbable calcium salt bone void filler intended to fill bony voids or gaps of the skeletal system (i.e. the extremities, spine and pelvis,) caused by trauma or surgery, that are not intrinsic to the stability of the bony structure. BIOSORB® Resorbable Void Filler does not possess sufficient mechanical strength to support reduction of a defect prior to soft and hard tissue ingrowth. Rigid fixation techniques are recommended as needed to assure stabilization of the defect in all plans.	NuROs Bone Graft Substitute is an implant intended to fill bony voids or gaps of the skeletal system, i.e., extremities and pelvis. These osseous defects are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. NuROs Bone Graft Substitute resorbs and is replaced with bone during the healing process.

Biocompatibility		Established	Established
Sterility		Sterilize (gamma radiation) Single use only	Same as predicate
Similarity			
Structure		multidirectional interconnected porosity structure	Same as predicate device
Chemical composition		β-Tricalciumphosphate (Ca3(PO4)2)	Same as predicate device
Mechanical Strength		Does not impart mechanical strength to surgical site	Same as predicate device
Porosity of material		70%	70%
Ca/P ratio		1.5	1.5
Pore size		30 ~400 μm	70 ~400 μm
Differences			
Shape and Size	Granule type	vary in particle size (0.6mm to 3mm)	• 0.2 ~ 0.5mm • 0.5 ~ 1mm • 1 ~ 2mm • 3mm
	Block type (LxHxW mm)	10 x 10 x 25 15 x10 x 4 30 x 20 x10	5 x 5 x 10 5 x 5 x 20 10 x 10 x10 10 x 25 x 25
	Cube type	vary in particle size (5mm to 10mm)	-
	Macroporous cubes	4mm x 4mm x 4mm	-
	Stick type	5mm x 5mm x 10mm, 5mm x 5mm x 20mm	-
	Cylinder type	6mm to 8mm	-

5.11 Similarity and differences

There were some differences between the proposed device and predicate device. The proposed device was designed in two type of shape (granule and block) with different particle size, predicate device was designed in six types (granule, block, cube, macroporous cube, stick and cylinder).

A series of bench tests were performed which included the chemical composition, elemental analysis, structure observation, specification of device porosity, TGA-residue analysis, ultra trace elements testing and pH testing. The results showed that same as the predicate device, the proposed device was composed of pure beta-TCP and all crystalline phase, no other impurities were presented, the ratio of Ca to P was approximately 1.5, has similar porous structures, no unsintered material or any trace elements and the ultra-trace elements concentrations were in accordance with the standard. The animal test data also showed that the proposed device, NuROs Bone Graft Substitute is as effective as the predicate device.

The proposed device has tested on safety and performance tests and the test results were complied with the test requests. Therefore, the differences of proposed device and predicate device didn't raise any problems of safety or effectiveness. The proposed device is substantially equivalent to the predicate device in design, operation, intended use and performance claims.

5.12 Conclusion

After analyzing bench and animal tests, device description and intended use/indications for use, it can be concluded that NuROs Bone Graft Substitute is as safe and effective as the predicate device.